

# *“MRI Guided Vascular Interventions”*

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# IGI Applications $\Rightarrow$ Clinical Need

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- Vascular Interventions

- Total occlusions - x-ray works poorly (no contrast)



*Need to image within the occluded segment and guide the intervention to improve safety/efficacy*

- Electrophysiology

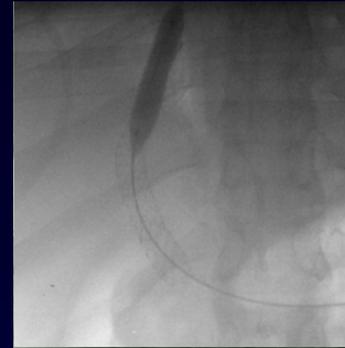
- Cardiac Ablation - benefits from imaging the device location and the affected tissue

# Interventional MR Platforms

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⇒ 0.5T - Open MRT  
- True XMR system



⇒ 1.5T - Main clinical platform  
- Wide range of sequences  
- Broad compatibility

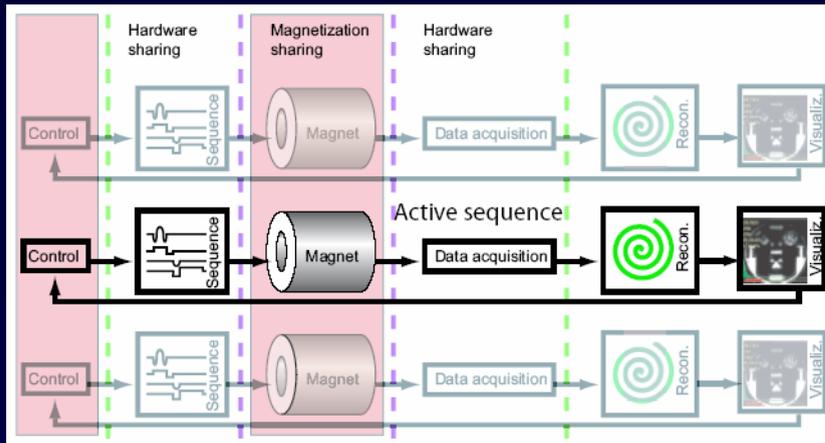


⇒ 3.0T - Future platform?  
- SNR, resolution  
- Off-resonance, heating

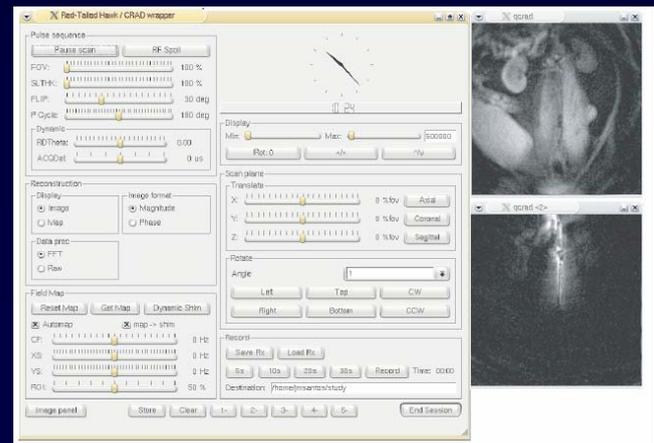


# Real-Time MR Interface

- Dynamic “Virtual Scanner” software architecture
  - Rapid switching between sequences/coils
  - Multi-channel imaging/display (now up to 4)
  - Real-time and hi-res Spiral, SSFP, Spin Echo, etc.
  - Integrated features: catheter tracking, color flow imaging



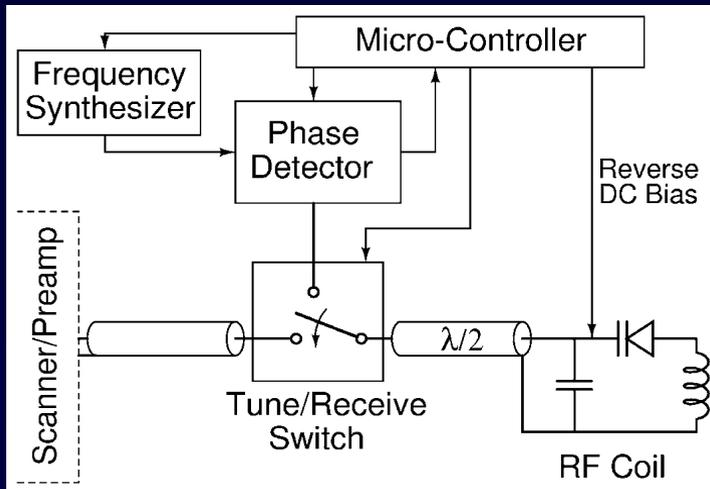
Virtual Scanner architecture



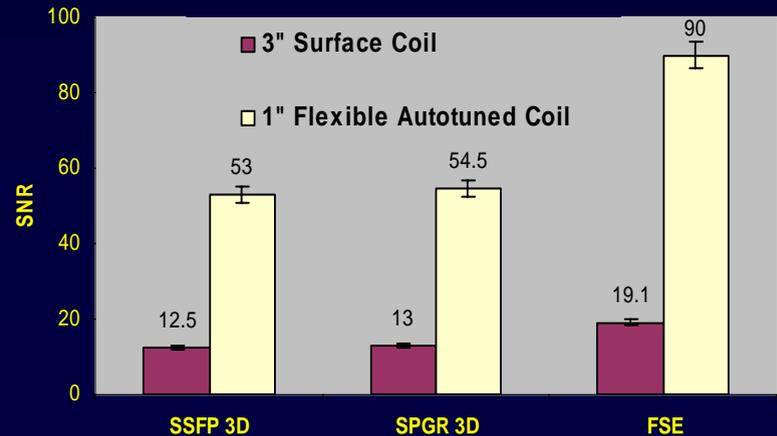
Multi-sequence/Multi-coil UI

# MR Catheter Coils

- Active “guidewire” for visualization, tracking, safety
  - Multiple channels - visualize body/tip, track tip/direction
  - Autotuning system - flexible geometry
  - Optically coupled electronics - safety



Automatic tuning electronics diagram



Ex vivo SNR of flexible autotuned interventional coil

# MRI of Vascular Occlusions

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- Occlusive model
  - Acute  $\Rightarrow$  Chronic
  - Rabbit  $\Rightarrow$  Pig ( $\Rightarrow$  Human)
  - Peripheral  $\Rightarrow$  Coronary
- Real-time imaging
  - Spatial vs. temporal resolution
  - Multi-channel imaging/tracking
- MR guidewire
  - Body and tip visualization
  - Safety
  - Mechanical features

Rabbit Model - Total Occlusion

# MRI of Myocardial Cryo Ablation

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- Freezing (“cryo”) is alternative to RF ablation
  - ? fewer complications
  - Less MR interference
- Real-time imaging
  - Signal void from “ice ball”
  - Gradient vs. spin echo
- MR-compatible cryo
  - Device artifact
  - Optimize for EP

